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TWO NEW SPECIES OF *CERATONEREIS* (POLYCHAETA: NEREIDIDAE) FROM ESTUARINE AREAS OF NEW SOUTH WALES, AUSTRALIA

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Abstract.—Two new species of *Ceratonereis, C. limnetica* and *C. turveyi,* are described from estuarine areas in New South Wales. *Ceratonereis limnetica* occurs in an upstream site where freshwater conditions predominate. The two new species belong to a group of *Ceratonereis* characterized by simple neurosetal falcigers. This group appears to have radiated within Australia.

While examining material from ecological surveys carried out in estuarine areas of southern Australia it became apparent that several species of *Ceratonereis* have been mistakenly identified as *C. erythraeensis* Fauvel. Three of these species were described by Hutchings and Turvey (in press) and in this paper an additional two species are described.

The following abbreviations are used: Allan Hancock Foundation (AHF), Australian Museum (AMW), British Museum (Natural History) (BMNH), Muséum National d'Histoire Naturelle, Paris (MNH), and Smithsonian Institution, Washington, D.C. (USNM).

Ceratonereis limnetica, new species
Fig. 1a–e

Holotype.—AMW 18668, 83 setigers, 64 mm length, 3.0 mm width. *Paratypes.*—2 specs., AHF Poly 1367; 2, BMNH ZB 1982.33–34; 2, USNM 071768; 2, AMW 18670; 41, AMW 18669; size range of paratypes 47 setigers, 15 mm length, 2.0 mm width to 84 setigers, 72 mm length, 3.5 mm width. All material from Lower Portland, Hawkesbury River, N.S.W., Australia (33°27′S, 150°54′E), coll. Glasby, 20 Nov 81, intertidal sandy beach.

Other material examined.—Ceratonereis vaipekae Gibbs: Holotype BMNH ZB 1972.1, Aitutaki, Cook Islands stn A6 coll. Gibbs 2.9.1969, muddy sand, MTL-LWN. *Ceratonereis erythraeensis:* Sénafir, island south of Suez Canal, Tadjoura Bay (Red Sea), Tuléar, Madagascar; and Lüta (=Dairen), China from MNH, identified by Fauvel but not part of type-series.

Description.—Body flattened, of uniform width anteriorly, gradually tapering posterior to middle setigers. Color in alcohol cream with brown granular pigmentation anterodorsally and prominent dorsal blood vessel. Prostomium width approximately equal to length, with deep medial groove extending from near tip to between anterior pair of eyes (Fig. 1a). Two pairs of small black eyes, anterior pair slightly further apart. Palps with globose style and dorsal groove across base, extending to level of frontal antennae. Four pairs of tentacular cirri, inner posterior pair largest, extending to setiger 4, appearing shallowly annulated. Eversible pharynx with slender, transparent brown jaws with 8 (left) and 6 (right) exposed teeth. Paragnaths present only in maxillary ring, as brown cones ar-

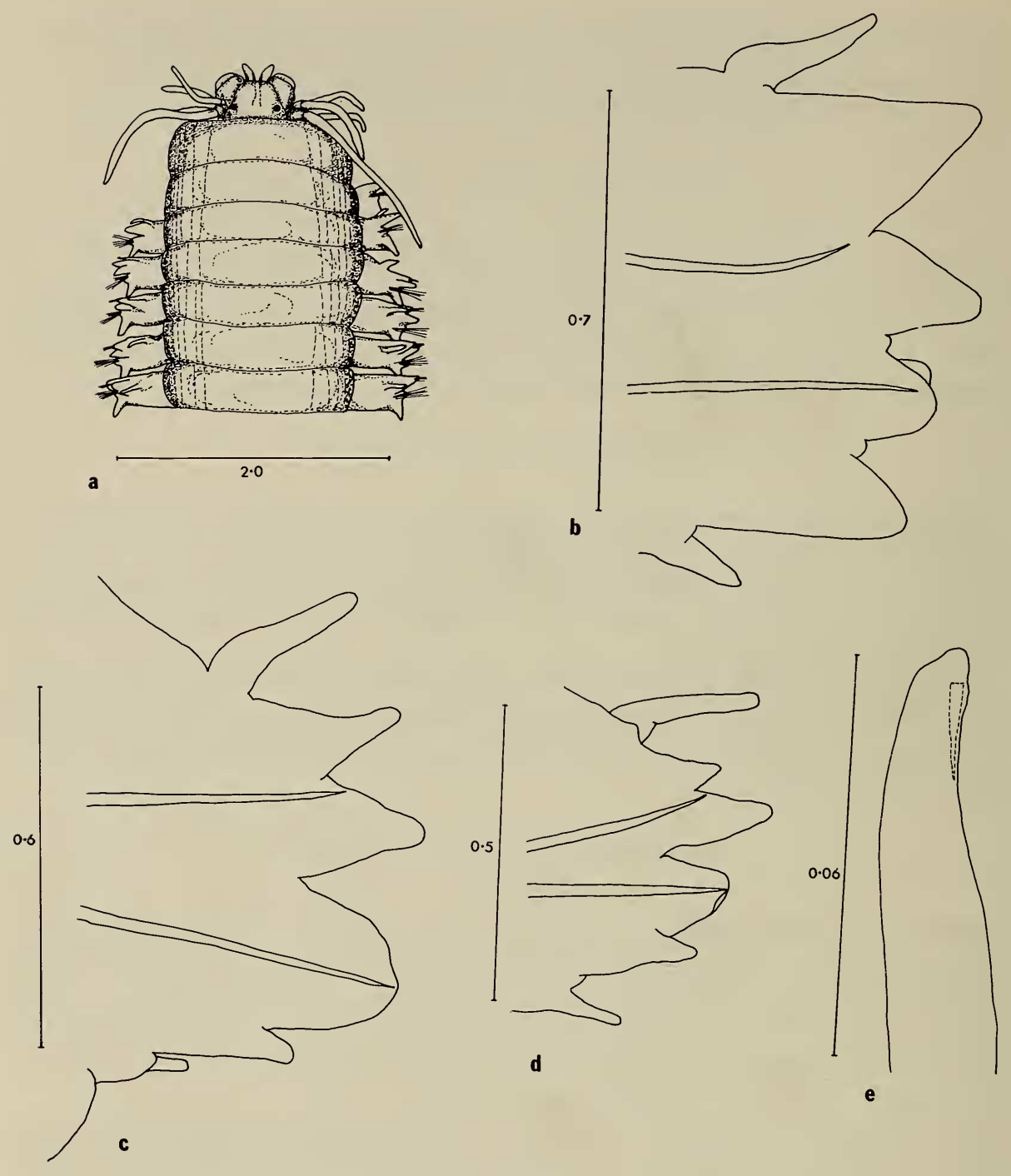

Fig. 1. *Ceratonereis limnetica*. a, Anterior dorsal view; b, Anterior view parapodium 10; c, Anterior view parapodium 40; d, Anterior view posterior parapodium; e, Giant simple falciger from 40th parapodium. Scale in mm.

ranged as follows: I = 1; II = 20 in oblique band; III = 32 in broad transverse band; IV = 26 in Y-shaped band.

Parapodial lobes bluntly conical anteriorly, more pointed and compressed posteriorly. First 2 parapodia uniramous, lacking dorsal notopodial lobe; subsequently notopodial lobes of comparable size except in posterior setigers where dorsal notopodial lobe is reduced, absent in last 2 setigers. Ventral neuropodial lobe well developed anteriorly, extending almost as far as notopodial lobe (Fig. 1b)

reduced to a small tubercle by about setiger 25 (Fig. 1c), but increasing in size relative to other lobes posteriorly (Fig. 1d). Dorsal neuropodial lobe with well developed bluntly conical post-setal lobe in first 10 setigers only, similar in size to ventral notopodial lobe but ligulate rather than conical in middle and posterior setigers. Dorsal cirri on all setigers, ⅔–1 times length of dorsal notopodial lobe in anterior and middle setigers, posteriorly elongating to 3–4 times length of dorsal notopodial lobe before latter decreases. Ventral cirri extending ¼–½ way to tip of ventral neuropodial lobe throughout.

Acicula black, brown at extremities. Numbers of setae in 10th, mid and posterior setigers respectively as follows: notosetae 7, 5, 2 homogomph spinigers; neurosetae dorsally 8, 5, 2 homogomph spinigers, 3, 0, 0 heterogomph falcigers and 0, 2, 1 giant simple falcigers; neurosetae ventrally 9, 7, 5 heterogomph spinigers and 7, 1, 0 heterogomph falcigers. Giant simple falcigers formed by ankylosis and fusion of teeth of heterogomph falcigers in dorsal neuropodial fascicle over about setigers 25–30. Dorsal neuropodial falcigers in this region with intermediate characteristics. Fully formed giant simple falcigers light brown, 3–4 times diameter of other setae, bluntly hooked with a distinct tendon (Fig. 1e).

Anal cirri ventrally produced, extending over last 5 setigers.

Variation.—Variations not described for the holotype include prostomium length 0.9–1.1 times width. Palps extend to just short of or well past antennae. Longest pair of tentacular cirri vary in length, extending to setigers 2–5. Jaws with 3–10 teeth. Paragnaths arranged as follows: I = 1–5; II = 15–30 in an oblique band, widest medially, III = 26–43 in a square or rectangular transverse band; IV = 20–43 in a Y- or V-shaped band. Relative lengths of parapodial lobes similar throughout. Postsetal neuropodial lobes indistinct in small specimens, but otherwise well developed in first 7–13 setigers. Numbers of setae in 10th, mid and posterior setigers respectively vary as follows: notosetae 5–10, 3–8, 1–4 homogomph spinigers; neurosetae dorsally 6–12, 4–9, 1–4 homogomph spinigers, 2–4, 0–1, 0 heterogomph falcigers and 0, 1–2, 1–2 giant simple falcigers; neurosetae ventrally 5–15, 2–11, 3–6 heterogomph spinigers and 2–7, 1–10, 0–1 heterogomph falcigers. Occasionally heterogomph spinigers found in dorsal neuropodial fascicle. Heterogomph falcigers in dorsal neuropodial fascicle anteriorly, developing into giant simple falcigers by middle setigers. Fully formed giant simple falcigers highly variable in shape, sometimes with 1–2 robust teeth surmounting main fang occasionally with 3–4 minute teeth proximal to main fang, but most often smooth (Fig. 1e). Variation in the nature of the giant simple falcigers occurs within and between specimens and appears to be independent of the size or position along the body of an individual.

Several gravid females were examined in the paratype material (AMW18669) and no signs of epitokal modifications were observed.

Discussion.—*Ceratonereis limnetica* belongs to the small group of *Ceratonereis* characterized by the presence of simple neuropodial falcigers. It may be distinguished from other members of this group occurring in Australia, for which descriptions have recently been made (Hutchings and Turvey, in press), in having post-setal neuropodial lobes in anterior setigers, relatively well developed ventral neuropodial lobes in posterior setigers and in the paragnath arrangement (Table 1).

Table 1.—Comparison of selected features between Australian *Ceratonereis* species characterized by the presence of simple neuropodial falcigers. Those species recently described by Hutchings and Turvey (in press) are designated by numbers.

Species	Simple neuropodial falcigers	Post-setal neuropodial lobe	Posterior ventral neuropodial lobe	Paragnath type and arrangement
C. limnetica	variable (smooth-denticulate)	present	well developed	brown cones; I = 1–5; II = 15–30 in oblique band; III = 26–43 in transverse band; IV = 20–43 in V- or Y-shaped band
C. n. sp. 1	denticulate	present	absent	transparent-dark brown cones, variable in size, paragnaths absent in Area III
C. n. sp. 2	denticulate	present	absent	transparent rounded cones and large elongate reddish cones; generally fewer paragnaths than for *C. limnetica*
C. n. sp. 3	denticulate	absent	small tubercle	brown cones; similar numbers and arrangement to *C. limnetica*
C. turveyi	denticulate proximally	absent	small tubercle by setiger 30	brown cones and domes I = 0–5, II = 5–15, III = 1–7, IV = 6–15

Ceratonereis erythraeensis Fauvel, 1918 from Madagascar and *C. vaipekae* Gibbs, 1972, from the Cook Islands differ from *C. limnetica* in the paragnath pattern and in the absence of post-setal neuropodial lobes in anterior setigers.

A large amount of *Ceratonereis* material from New South Wales estuaries and lagoons has been examined and it appears that *C. limnetica* has a very limited distribution, occurring only in the upper reaches of the Hawkesbury River, New South Wales. It represents the numerically dominant species of polychaete in the freshwater zone with densities of up to 1000 individuals per square meter, but also occurs in lesser numbers further downstream where salinities reach 20‰. Salinities at the collection site may reach 8‰ during periods of drought combined with the effects of a spring tide (A. Jones, pers. comm.). Juveniles of 20 setigers (about 2 mm length) are present throughout the year, but appear to be most numerous from January to May. Smaller individuals were not sampled for.

The closely related species, *C. n. sp. 3,* also occurs in the Hawkesbury River, although further seaward than *C. limnetica*. Unlike the latter, *C. n. sp. 3* is common in estuaries and lagoons throughout southern Australia. The occurrence of two morphologically similar species in the one estuary is unusual, but probably occurs in other estuaries of Australia and supports the idea suggested by Hutch-

ings and Turvey (in press) that the group of *Ceratonereis* characterized by the presence of simple neuropodial falcigers has radiated within southern Australia.

Etymology.—The name *limnetica* refers to the estuarine/freshwater habitat in which this species lives.

Australian distribution.—Upper Hawkesbury River, New South Wales.

Habitat.—Fresh and brackish water, often in sandy sediment or in mud. Subtidal and intertidal. Salinity range 0–20‰.

Ceratonereis turveyi, new species
Fig. 2a–f

Holotype.—AMW 14981, 114 setigers, 16 mm length, 1.2 mm width. *Paratypes.*—1 spec. AHF Poly 1368; 1, BMNH ZB1982.35; 1, USNM 071769, 3 AMW 18667; 1, 11276, range from 80 setigers 10 mm length, 0.9 mm width to 32 setigers, 4 mm length and 0.6 mm width (incomplete specimen). All material collected from *Posidonia* seagrass beds, Merimbula, N.S.W., Australia (36°55′S, 149°55′E) during 1976 by New South Wales State Fisheries.

Description.—Body flattened, widest over anterior half, gradually tapering posteriorly. Color in alcohol, yellow-white with light brown pigmentation anterodorsally, especially on anterior prostomium, on palps, and around eyes. Prostomium length about equal to width, with a shallow medial groove extending from near tip to level with base of palps. Two pairs of reddish eyes, anterior pair slightly further apart. Palps with large globose style and stout cylindrical base, extending to just short of frontal antennae. Four pairs of tentacular cirri appear deeply annulated, inner posterior pair largest, extending to setiger 4. Eversible pharynx with slender, transparent brown jaws carrying 2 exposed teeth in addition to long curved main fang. Paragnaths present in maxillary ring as small light brown cones and larger dark brown cones with light brown bases, arranged as follows: I = 5; II = 14 in 2 rows on right and triangular patch on left; III = 7 in transverse line; IV = 15 in V-shaped band; oral ring bare.

Parapodial lobes conical (Fig. 2a) becoming compressed and more pointed posteriorly (Fig. 2b, c). Notopodial lobes and ventral neuropodial lobe more elongate than dorsal neuropodial lobe throughout. First 2 parapodia uniramous, lacking dorsal notopodial lobe. Dorsal notopodial lobe initially reduced, increasing posteriorly to approximately same size as ventral notopodial lobe by middle setigers, thereafter decreasing to ⅓ size of ventral notopodial lobe, absent in last 15 setigers. Dorsal neuropodial lobe without post-setal lobe, slightly smaller and less elongate than notopodial lobes in anterior and middle setigers, about ⅓ size of ventral notopodial lobe in posterior setigers. Ventral neuropodial lobe comparable in size to dorsal neuropodial lobe anteriorly, reduced to small tubercle from about setiger 30 onwards. Dorsal cirri on all setigers, 1–1½ times length of dorsal notopodial lobe in anterior and middle setigers, posteriorly elongating to about 3 times length of dorsal notopodial lobe, before latter decreases. Ventral cirri extending $^1/_2$–$^4/_5$ way to tip of ventral neuropodial lobe throughout.

Acicula dark brown-black, hyaline at extremities. Numbers of setae in 10th, mid and posterior setigers respectively as follows: notosetae 9, 8, 3 homogomph spinigers; neurosetae dorsally 8, 4, 3 homogomph spinigers, 3, 0, 0 heterogomph falcigers and 0, 1, 1 giant simple falcigers; neurosetae ventrally 4, 1, 2 hetero-

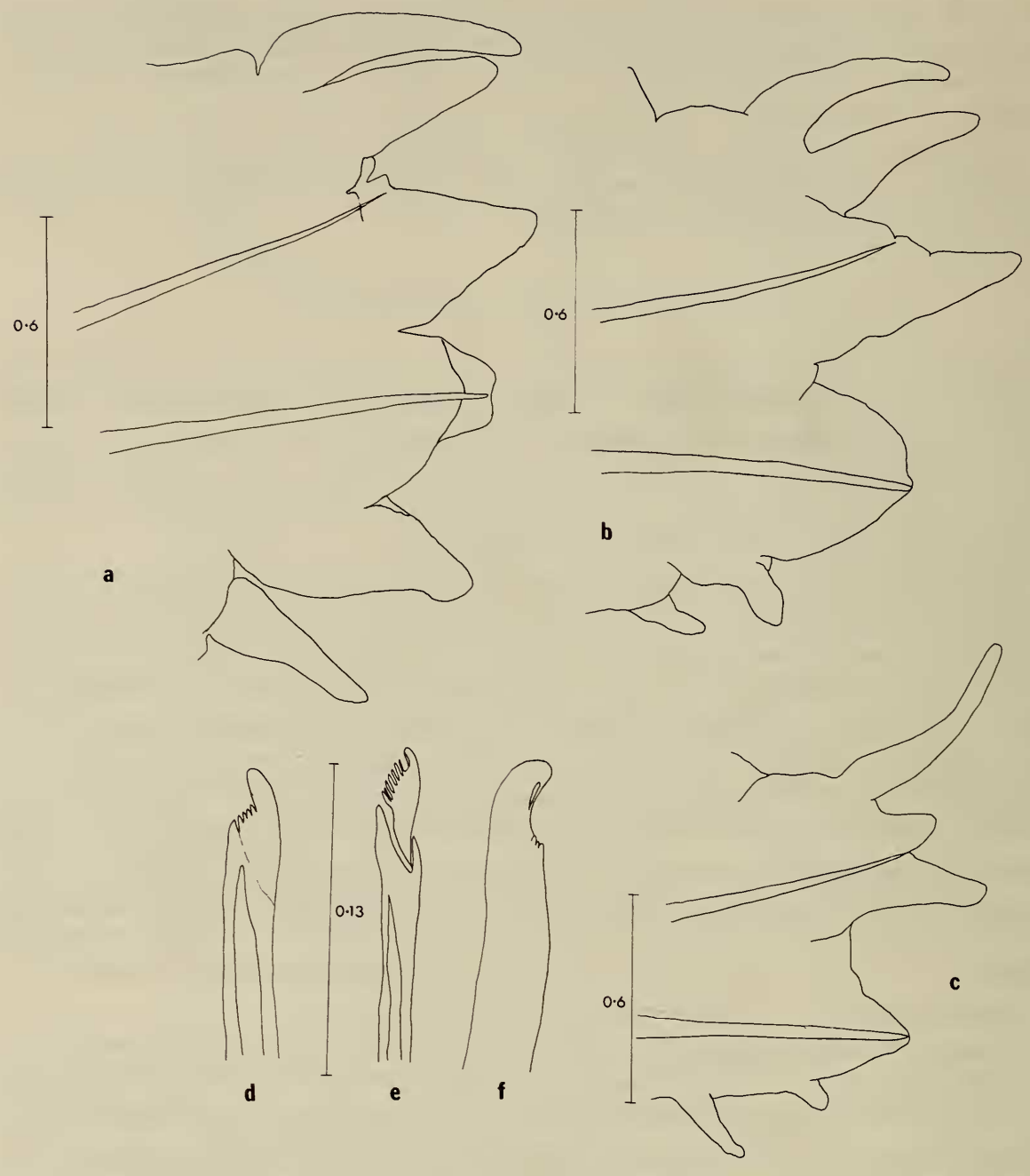

Fig. 2. *Ceratonereis turveyi*. a, Parapodium 11, posterior view; b, Parapodium 35, anterior view; c, Posterior parapodium anterior view; d, Dorsal neuropodial falciger, parapodium 21, showing partial fusion of blade to shaft; e, Ventral neuropodial heterogomph falciger, parapodium 21; f, Fully formed giant simple falciger, posterior parapodium. Scale in mm.

gomph spinigers and 6, 10, 2 heterogomph falcigers. Giant simple falcigers formed by ankylosis and rearrangement of teeth of heterogomph falcigers in dorsal neuropodial fascicle over about setigers 20–25. Dorsal neuropodial falcigers in this region with intermediate characteristics (Fig. 2d). Fully formed giant simple falcigers about 2 times diameter of other setae, with an indistinct tendon and 3 small denticles proximal to bluntly conical main tooth (Fig. 2f). Heterogomph falcigers with very short blades in middle and posterior setigers (Fig. 2e), otherwise setae normal. Anal cirri ventrally produced, extending over last 10 setigers.

Variation.—Variations not described for the holotype include prostomium length

equal to 0.9–1.2 times width. Longest pair of tentacular cirri varying in length, extending from setigers 3–7; appearing only shallowly annulate in some small specimens. Jaws with 2–5 teeth. Paragnaths variable in shape and color within and between individuals ranging from light brown to dark brown cones; dark brown paragnaths generally larger. Paragnaths arranged as follows: I = 0.5; II = 5–15 in an oblique or triangular patch; III = 1–7 in a transverse line or irregularly arranged; IV = 6–15 in a V-shaped or curved band. Relative lengths of parapodial lobes similar throughout in paratype material except for dorsal notopodial lobe which may be absent from setigers 3 and 4 in smaller specimens; dorsal notopodial lobe absent posteriorly in last 12–15 setigers. Numbers of setae in 10th, mid and posterior setigers respectively as follows: notosetae 5–9, 6–8, 3–4 homogomph spinigers; neurosetae dorsally 3–8, 2–5, 2–3 homogomph spinigers, 2–3, 0, 0 heterogomph falcigers and 0, 1, 1 giant simple falcigers; neurosetae ventrally 3–4, 1–3, 2–4 heterogomph spinigers and 3–6, 3–10, 2–3 heterogomph falcigers. Heterogomph falcigers in dorsal neuropodial fascicle anteriorly, developing into giant simple falcigers by middle setigers. Anal cirri long, ventrally produced, extending over last 7–10 setigers.

None of the material has obvious coelomic gametes.

Discussion.—In Table 1, the characteristics separating *Ceratonereis turveyi* from other Australian *Ceratonereis* species possessing simple falcigers are shown. *Ceratonereis turveyi* differs from these species in that the main fang is smooth, the few teeth present occur proximally to the main fang (Fig. 2f).

Etymology.—This species is named for S. Paul Turvey who drew our attention to it.

Australian distribution.—New South Wales (Merimbula).

Habitat.—*Posidonia* seagrass beds. The species was collected during a quantitative survey of the beds, the results of which are described by Collett *et al.* (in press), where the species is erroneously referred to as *C. erythraeensis* Fauvel. Sediment: muddy sand in predominantly marine conditions.

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